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ABSTRACT

Investigated was the effectiveness of various reinforcement contingencies in diminishing social withdrawal in children, which is defined in terms of low rates of social interaction. Ss were three socially withdrawn first and second graders in three different regular classes, as determined by scores on the Walker Problem Behavior Identification Checklist. A behavioral coding system was developed for observing and recording social interactions in the classroom. Following training of the withdrawn child in social interaction skills using a symbolic modeling procedure, the S was reinforced (earned points) when she got a peer to initiate to her in Experiment I; in Experiment II, the peer group was trained and then earned points for each initiation by the S to a peer; Experiment III was a combination of I and II. Results showed that individual token reinforcement, group token reinforcement, and a combination of individual and group reinforcement were all effective in increasing the social interaction rate of withdrawn Ss, with the combined procedures in Experiment III producing the most dramatic changes in rate. (KW)

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REPORT NO. 6

THE USE OF GROUP AND INDIVIDUAL REINFORCEMENT CONTINGENCIES IN THE MODIFICATION OF SOCIAL WITHDRAWAL

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THE USE OF GROUP AND INDIVIDUAL REINFORCEMENT CONTINGENCIES IN THE MODIFICATION OF SOCIAL WITHDRAWAL[1]

May, 1972

Hill M. Walker and Hyman Hops

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During recent years, a number of studies have been reported in the literature dealing with the problem of social withdrawal in children and adults (Allen, Hart, Buell, Harris, & Wolf, 1964; O'Connor, 1969; Guerney & Flumen, 1970; and Milby, 1970). Social withdrawal has usually been defined in terms of low rates of social interaction; an interaction referring to a reciprocal involvement between two or more persons (O'Connor, in press; and Whitman, Mercurio, & Caponigri, 1970).

The process of social interaction provides for the acquisition, rehearsal, and eventual strengthening of essential social skills. As such, it has been advocated as a critical prerequisite for much of a child's behavioral development (Whitman, et al., 1970). Thus, the absence of or extremely low rates of social interaction may actually retard such development.

A variety of treatment procedures have been used for increasing the frequency and duration of social interactions. Specific treatment techniques include adult social reinforcement (Allen, et al., 1964; and Milby, 1970), adult social reinforcement plus priming (Buell, Stoddard, Harris, & Baer, 1968; Baer & Wolf, 1970; and Hart, Reynolds, Baer, Brawley, & Harris, 1968), symbolic modeling (O'Connor, 1969), symbolic modeling, shaping, and symbolic modeling plus shaping (O'Connor, in press), social reinforcement plus tangible reinforcement (Kirby & Toler, 1970; and Whitman, Mercurio, & Caponigri, 1970), and client centered play therapy (Guerney & Flumen, 1970). The effectiveness of these procedures in modifying isolate behavior has been clearly validated.

The majority of studies on social withdrawal have used natural social reinforcers such as praise, approval, and attention to increase

social interaction rate. Few studies have used token reinforcement procedures for this purpose. This may be due, in part, to the easy availability of adult social reinforcement in such settings as preschools, classrooms, and institutions where social withdrawal studies are often conducted. In addition, the use of reinforcers natural to the setting in which social interaction is expected to generalize may facilitate maintenance of increased social interaction rates after formal treatment is terminated.

Several studies have been reported which describe less direct methods of increasing social interaction rate than the simple reinforcement of social initiations with adult attention. For example, Buell, et al. (1968), used social reinforcement of a child's motor skills as a tactic to increase her rate of social contact with other children. The subject was socially reinforced for using outdoor play equipment. This resulted in an increased proximity to peers using the same equipment. Consequently, increases were produced in social interaction rate with peers as well as in other collateral child behaviors.

In a study by Kirby and Toler (1970), a 5-year-old boy with a low rate of interaction with his nursery school classmates was induced to pass out candy as a tactic to increase his rate of interaction with them. The study was designed to minimize the time and effort required of the teacher in achieving this goal. The rationale for the tactic was twofold: (1) by dispensing a reinforcing stimulus to his peers, it was conceivable that the target subject would acquire conditioned reinforcing properties which would make his classmates more inclined to interact with him; and (2) dispensing the candy would serve as a priming device which would stimulate increased social interactions with his classmates. The

procedure proved to be highly effective and required very little investment of teacher time. In addition, it demonstrated peer reinforcement contingencies to be a powerful resource for modifying isolate behavior.

O'Connor (1969) has demonstrated that reinforcement procedures are not absolutely essential for the modification of social withdrawal. By using a symbolic modeling procedure (a film) depicting positive social consequences for interacting with peers, he showed that the level of social interaction of preschool isolates could be increased to the level of their nonisolate classmates. A comparable group of isolates who saw a control film did not increase their social interaction rate. The actual amount of invested time in this treatment procedure was minimal (23 minutes) and no teacher time was required to administer the treatment. Although the long term maintenance of social interaction rate following such treatment needs to be evaluated, the effectiveness and economy of the symbolic modeling procedure is impressive.

In summary, there appear to be some effective treatment procedures available for modifying social withdrawal which do not rely upon adult social reinforcement. Such procedures may be especially valuable for regular classroom teachers who generally do not have the time to selectively reinforce and monitor the behavior of withdrawn children over long periods of time.

Additional research is needed to develop social withdrawal treatment procedures that are effective, economical, and relatively independent of teacher monitoring. Procedures are also needed that simultaneously facilitate the acquisition of social skills required in social interaction as well as provide opportunities to rehearse and develop those skills

through increased peer interaction. O'Connor (1969) has suggested that the exclusive use of reinforcement procedures to increase social interaction rate may produce difficulties if the withdrawn child has not learned the necessary social skills required to initiate and maintain social interactions with other children.

The present study investigated the effects of a symbolic modeling training procedure combined with three different reinforcement contingencies for modifying social withdrawal. Following training in social interaction skills, the withdrawn child and/or his peers were reinforced with tokens (points) contingent upon an increased rate of social initiation. A separate experiment was conducted to evaluate the effects of each contingency. Experiment I evaluated training combined with an individual reinforcement contingency; experiment II, training combined with a group reinforcement contingency; and experiment III, training combined with an individual-group reinforcement contingency.

Method

Subjects

The primary criterion for subject selection was a low rate of social interaction relative to other peers in the same classroom. Initially, a group of subjects was selected on the basis of their scores on the social withdrawal subscale of the Walker Problem Behavior Identification Checklist (WPBIC) (1970).

The WPBIC, a classroom screening instrument for identifying children with behavior problems, was completed on 1,067 children in grades one, two, and three in the local school district as part of a separate normative

study. Twelve subjects were selected from this sample for more systematic and intensive observation. Each of the selected subjects had scores on the social withdrawal subscale that were greater than one standard deviation from the standardization mean. Items making up this subscale consisted of such behaviors as, "tries to avoid calling attention to himself," "does not engage in group activities," "has no friends," "doesn't protest when others hurt, tease, or criticize him," and "does not initiate relationships with other children."

All 12 subjects were systematically observed in their regular classrooms to determine whether their social interaction rates corresponded with the teachers' ratings on the WPBIC. Of the sample of 12 subjects, three were selected who emitted the lowest observed rates of social interaction relative to their peers.

Settings

The three experiments were conducted in regular elementary classrooms. Observations were recorded across instructional periods. Classroom activities sampled during observation periods included teacher and peer led discussion sessions, individual seat work, and other relatively unstructured group and individual activities.

No observations were recorded during recess or lunch periods or during other activities outside the classroom setting. Transitions during class period involved only those situations in which the class was changing from one subject activity to another.

The three experiments were carried out in three separate elementary schools. The subjects were enrolled in grades one and two. Each

subject's teacher cooperated with the experimenters in implementing the contingencies and carrying out the study.

Observation and Recording

A behavioral coding system was developed for observing and recording social interactions in this study. An interaction was defined as a reciprocal social exchange between two subjects. Two elements were required in order for an interaction to be coded: a directed social stimulus (initiation) by one subject and an observable response to that stimulus by another subject. Thus, initiations that were ignored were not recorded as interactions.

The coding system consisted of 10 behavior categories and provided a sequential account of social interaction between a target subject and his or her peers. It was possible to derive the antecedents as well as consequences of social interactions from this code. The code also provided for measuring the duration of interactions in seconds. Although antecedent and consequence data were recorded for each interaction, only frequency and duration of social interaction and number of different peers interacted with were used as dependent variables in this study.

An observer recorded the behavior of the subject only when an interaction occurred. The identity and initial response (social stimulus) of the child initiating the interaction was noted on an appropriate space on the observation form. A stopwatch was also activated simultaneously to record the duration of the interaction. The subsequent behaviors of the subjects engaged in the interaction were observed and recorded until the interaction was terminated. The stopwatch was depressed as soon as the final response in the interaction was recorded.

Observation sessions averaged 30 minutes in length. No more than one 30-minute session was recorded per day.

The observation form consisted of two sections: the top half provided space for general identifying information on the subjects and the classroom setting. The lower half was used for recording social interactions. On each line of the latter section, an observer recorded the behavior of the target subject as well as the behavior of peers involved in the interaction. Space was also provided to allow recording of the class activity and the duration of each interaction.

Examples of the behavior categories are: cooperative--referring to cooperative behavior during work or play; work alone--referring to solitary or parallel play/work; attend--an individual observing the behavior of another for longer than 5 seconds; positive physical--physical contact that is affectional; negative physical--physical aggression designed to injure or inflict pain.

A second observational procedure was developed for the purpose of collecting normative data on the rate of social interaction for all peers in each of the three classrooms. The procedure involved recording the total number of social interactions occurring in the classroom during an observation period and dividing this figure by N/2, half the total number of children in the classroom. (Dividing by N/2 assumes that at least two subjects have to be interacting for an interaction to be coded.) This figure, subsequently divided by time, constituted the mean rate per minute of social interaction for the entire class. The same classroom activities were sampled during collection of the group social interaction data as were sampled during data collection on the individual

target subject's interactions. However, these two sets of data were never collected simultaneously.[2]

The estimate of group social interaction rate was used for three purposes in the present study: (1) it provided a standard measure for comparing overall social interaction rate across the three classrooms; (2) it served as an additional baseline for evaluating the effects of each contingency upon the target subjects; and (3) it provided an index of the stability of social interaction rate over time for subjects in each of the three classrooms.

Reliability

Two graduate students were trained to use the coding system for recording social interactions between the subjects and their peers. An arbitrary criterion for acceptable inter-observer reliability was set at five consecutive interactions with 80 percent or better agreement. Agreement was calculated by dividing the total number of agreements by the total number of behaviors recorded by both observers. Behaviors recorded by only one observer were tallied as disagreements. No observer data were utilized until this criterion was achieved.

Reliability was also estimated on duration of social interaction. Pearson product moment correlations were computed between the duration scores of the two observers over a series of simultaneous recordings. The mean correlation for six consecutive sessions was 0.96.

Correlations, however, do not take into account the possibility of differences in the levels of the scores. For example, it is possible for one observer to systematically over or underestimate the other, thereby creating high correlations based on scores at differing levels. Therefore,

a t-test was calculated for the difference between the means for the six observations and found to be nonsignificant.

A third observer was trained to collect social interaction rate data on all peers in each of the three classrooms. This observer did not use the observation form described above but simply tallied social interactions as they occurred. Prior to the collection of the normative data, two reliability checks were held between this observer and one of the two observers trained to collect individual interaction data. Since the total frequency per unit of time was the main consideration in this data collection procedure, percent agreement was calculated by dividing the smaller number of interactions recorded by an observer by the larger number recorded by the other for each session. The reliability coefficients obtained for the two sessions were .82 and .93, respectively.

Design

As mentioned earlier, most studies of social withdrawal and isolate behavior have directly reinforced social interactions between the withdrawn child and his peers. As a rule, contingent teacher attention has been the reinforcing stimulus used to increase social interaction rate in these studies. The effectiveness of this approach has been impressive. (Allen, et al., 1964; Milby, 1970; and Whitman, et al., 1970). However, in these studies, the withdrawn child is generally able to produce external reinforcement for himself by simply initiating social interactions with other children. As a result, neither the withdrawn child nor his peers are required to appreciably alter the quality of their interactive behavior in order to meet the requirements of the reinforcement contingency. The initiation and maintenance of social interactions are

usually sufficient to produce reinforcement on a nearly continuous reinforcement schedule.

The purpose of this study was to provide either the withdrawn child and/or his peers with training in specific social interaction skills and then to make reinforcement indirectly contingent upon the use of those skills in increasing social interaction rate. That is, rather than initiating to other children, the target subject(s) would have to be skilled enough to get other children to initiate to them. In experiment I, for example, the withdrawn subject was given training in social interaction skills using a symbolic modeling procedure developed by O'Connor (1969). Immediately following the training, a reinforcement contingency was implemented in which the withdrawn subject could earn one point for each interaction that resulted from a peer initiating to her. Initiations by the withdrawn subject to peers did not result in reinforcement. When a required number of points was earned, they were exchanged for a pre-selected backup reinforcer.

Experiment II was the reciprocal of experiment I. In this experiment, the withdrawn subject's peers were given training in social interaction skills (using the same procedure) and then a contingency was implemented in which the peer group could earn one point for each initiation by the withdrawn subject to any peer. Initiations by peer group members to the withdrawn subject did not produce reinforcement. When a required number of points was earned, they were exchanged for a pre-selected group reinforcement for the entire class.

Experiment III was a combination of experiments I and II. For example, the withdrawn subject could earn a point whenever any peer

initiated to her. Conversely, the peer group could earn one point whenever the withdrawn subject initiated to any peer. Both the peer group and the withdrawn subject were required to earn a predetermined number of points before they could be exchanged for the respective backup reinforcers. In addition, both the peers and the withdrawn subject had to achieve their respective point totals before either could exchange their points. The withdrawn subject exchanged her points for a pre-selected individual reinforcement, while her peers exchanged theirs for a pre-selected group reinforcement.

Experiment I

The Use of Individual Token Reinforcement to Increase Social Interaction Rate

The effectiveness of a particular reinforcement contingency in increasing social interaction rate may depend, in part, upon the nature of the social withdrawal. For example, there may be a considerable discrepancy between the withdrawn child and his peers in the rate with which they initiate social interactions with each other. In such cases, withdrawn children who have low rates of initiating to their peers may require different interventions than those who have high rates but whose peers make few social initiations.

The withdrawn subject in experiment I had a mean rate of initiating social interactions with her peers, during $baseline_1$, that was significantly greater than the mean rate of her peers' initiation to her (.13 versus .09 per minute; $t = 2.89$, $df = 15$, $p < .02$). Thus, a reinforcement contingency was implemented for this subject which was designed to increase the rate with which her peers initiated to her.

Procedure

The experiment followed an ABAB design (Bijou, Peterson, Harris, Allen, & Johnston, 1969) in which baseline and experimental conditions were alternated. The withdrawn subject for experiment I was a second grade, female student.

Baseline$_1$. A total of 16, 30-minute observation recordings were taken on the subject's behavior over a 2-month baseline period. During this period, she was not informed that recordings of her behavior were being made.

The classroom teacher knew that the child had been selected as a withdrawn subject and that an intervention program was planned. However, she was not informed as to its purpose or design during this period.

Reinforcement period 1. Immediately after stable baseline estimates of the subject's peer interaction rate were obtained, one of the Es met with her during a lunch period. The child was informed that she had been observed for some time by an observer who had noted that her social interaction rate was quite low. In addition, she was told that the experimenters would like to help her increase her interactions with her classmates.

A 23-minute color film depicting a series of social interactions between nursery school children, used in a previous study (O'Connor, 1969), was shown to the child. The film and soundtrack covered various ways of initiating social interactions with others, in a step-by-step fashion, continually emphasizing the positive value of such behavior. In the film, nursery school children who engaged in social interactions were socially reinforced by their peers and the commentator.

The E tested the subject to make certain she was able to reiterate some of the statements made in the film. The child was then informed that a backup reinforcer, of her own choice, would now be made contingent upon initiations to her by peers. That is, she was told that she would earn one point for each initiation made to her by a classmate during the time the observer was in the room. When she had acquired 50 points she could exchange them for the pre-selected tangible reinforcer. The child chose two pet white rats and a cage as her first selection.

A paper "thermometer" chart was placed on her desk with a top level of 50 points. The first observation occurred immediately after the film was shown. After each observation, the observer told the child how many points she had earned during that period, and the "thermometer" was filled in a cumulative fashion.

Baseline$_2$. Observations during this phase were collected on five days over a 2-week period. However, the subject was not informed about the data (number of interactions) and no reinforcement contingencies were programmed.

Reinforcement period 2. The same E met with the subject again and reviewed the behaviors necessary for increasing social interactions, as presented in the film. A 50-point reinforcement contingency was again established. The subject's choice of a backup reinforcer during this phase was two Barbie Dolls to add to her collection.

Results

Fig. 1 contains the total interaction rate per observation session for the withdrawn subject and intermittent samples of the overall peer interaction rate during the four phases of the experiment.

Insert Figure 1 About Here

The withdrawn subject's (S_1) average interaction rate per minute with her peers during the four phases of experiment I was as follows: $baseline_1$, .22; $intervention_1$, .59; $baseline_2$, .36; $intervention_2$, .71. The overall interaction rate for the entire class across the four phases was .44 and ranged from .26 per minute to .70 per minute. Thus, S_1's interaction rate was below the mean of her peer group during the baseline phases and well above this figure during the two experimental phases.

Inspection of Fig. 1 reveals that in addition to increasing overall interaction rate, the intervention procedures had a considerable effect upon S_1's session-to-session variability. For example, her interaction rate varied from .06 to .44 per minute across the $baseline_1$ sessions. However, during $intervention_1$, her rate varied from .13 to 1.00 per minute. During $baseline_2$, the range was from .19 to .75, and during $intervention_2$, from .19 to 1.35.

S_1's mean rate during $baseline_2$ did not return to her pre-intervention rate of .22. However, Fig. 1 indicates that the subject's interaction rate during the last three sessions of $baseline_2$ approximated her rate during the last six sessions of $baseline_1$. The relatively higher rates

during the first two sessions of baseline$_2$ may reflect generalization (over time) of treatment effects from the prior phase.

Conversely, there was only a minor increase in the subject's interaction rate during the first three sessions of intervention$_2$. This was followed by a substantial increase during the last three sessions of this phase. The initial low rate may have been due to the subject having to relearn the skills necessary to increase her peers' initiations during this period.

Insert Figures 2 and 3 About Here

Fig. 2 and 3 contain $\underline{S}_1$'s social interaction rates which resulted from peers initiating to her (Fig. 2) versus her initiating to peers (Fig. 3). In Fig. 2, the mean social interaction rates during the four phases were, respectively, .09, .32, .15, and .36.

In Fig. 3, the mean rates were .13, .27, .21, and .35. The intervention procedures thus increased the peers' initiations to the subject as well as her initiations to them. There was also an increase in the reciprocity of the two initiation rates during intervention. For example, there were considerable discrepancies between the rates during baseline phases (.09 vs .13 for baseline$_1$ and .15 vs .21 for baseline$_2$). This is in contrast to the intervention phases where the rates were more nearly balanced (.32 vs .27 for intervention$_1$ and .36 vs .35 for intervention$_2$).

Insert Figure 4 About Here

Fig. 4 contains the number of different peers the withdrawn subject interacted with during observation sessions. These data were collected during the last six sessions of baseline$_1$ and during all sessions of the remaining three phases. The mean number of different peers interacted with across the four phases were, respectively, 4, 5, 2.8, and 4. Although the mean differences between phases do not appear to validate a systematic increase during interventions 1 and 2, the data in Fig. 4 suggest that there was an increasing trend during these phases. This was especially true during intervention$_2$. Such an increase would be an artifact of the reinforcement contingency since the subject was not required to interact with different peers in order to produce reinforcement.

The duration (in seconds) of interactions occurring during each observation session were recorded for the withdrawn subject and her peers. Duration data were recorded for both peer initiated and subject initiated interactions.

The mean duration of interactions across the four phases of experiment I were 16 seconds for total interactions, 15 seconds for subject initiated interactions, and 17 seconds for peer initiated interactions. There was no systematic trend for the interactions to increase or decrease in length as baseline and experimental phases were implemented. Thus, the duration of social interactions, whether initiated by the subject or her peers, proved to be a relatively insensitive measure of the effects of the reinforcement contingency in experiment I.

Discussion

The changes that occurred in S_1's social interaction rate, when baseline and experimental phases were alternated, indicate that the reinforcement contingency had a powerful effect in increasing her social interactions with peers. The reversal effects that occurred when the contingency was withdrawn and then reintroduced indicate that the rate changes were due to the manipulated variable rather than to chance or extraneous variables. Reversals were obtained in total interaction rate as well as in peer initiated and subject initiated interactions.

The overall rate of peer interaction (Fig. 1) provided a further baseline for evaluating the reinforcement contingency. This figure remained relatively constant across the four phases of experiment I and averaged .44 per minute. When the contingency was introduced, the subject's interaction rate increased to a level well above this rate. Conversely, when it was withdrawn, her interaction rate fell below the class average.

The purpose of experiment I was not only to increase S_1's overall social interaction rate, but to also reduce the discrepancy between her initiation rate and that of her peers. The data in Fig. 1, 2, and 3 indicate that both these goals were achieved. In Fig. 2 and 3, the peers' rate of initiation to the subject was very similar to the rate with which she initiated to them during the interventions phases. As a matter of fact, the peer initiation rate exceeded S_1's initiation rate during intervention$_1$. However, in the next baseline phase when the contingency was withdrawn, the peer initiation rate was again well below that of S_1 (as in baseline$_1$). During intervention$_2$, the rates were nearly identical, thereby replicating the effect obtained in intervention$_1$.

Although S_1 did not receive token reinforcement for increasing her initiation rate to peers (only for peer initiations to her), her peer initiation rate showed an increase whenever the reinforcement contingency was in effect. Presumably, this was a "priming" technique that S_1 used to increase the frequency of peer initiations to her. Although increases in the two rates occurred concurrently, it was not possible to determine whether S_1's increased initiation rate actually accounted for the increased peer initiation rate.

It was also not possible to precisely determine the effects of the symbolic modeling procedure in increasing S_1's interaction rate. If the film alone accounted for the increases in S_1's social interaction rate, there should have been no decrease in rate when the reinforcement contingency was withdrawn during $baseline_2$. Presumably, the reinforcement contingency alone could also have accounted for the increased rate. However, another experiment would be required to answer this question.

It seems more likely that some interaction between the symbolic modeling and reinforcement contingency produced the increase in social interaction rate. For example, it took several sessions for the interaction rate during $baseline_2$ to return to $baseline_1$ levels. This may have been due to the earlier strengthening of those skills acquired by S_1 through the symbolic modeling procedure. That is, even though peer initiated interactions no longer produced reinforcement for S_1, the strengthened behaviors continued to be emitted for two sessions until they extinguished.

During $intervention_2$, the reinforcement contingency was in effect for three sessions before its effect upon interaction rate was clearly

demonstrated. In a similar fashion, this may have been due to the subject's having to relearn the skills required to increase her peers' initiation rate to her (which may have taken several sessions). It was not possible to confirm or deny this hypothesis from data collected in experiment I. However, it is interesting to note that the peer initiation rate did not show an increase until $\underline{S}_3$ increased her rate of initiating interactions.

It does appear, however, that the subject increased the range of peers she interacted with as well as her interaction rate with them, even though reinforcement was not made contingent on increasing the number of different peers. She could have simply increased the initiation rate of only one or two subjects and achieved the same effect. However, it would be more likely that a higher overall peer initiation rate would be achieved if a larger number of subjects were initiating to her.

The data in Fig. 4 suggest that the subject did increase the number of different peers she interacted with during interventions 1 and 2, but this behavior pattern did not maintain when reinforcement was terminated in baseline$_2$. The frequency increased again, however, when the reinforcement contingency was reintroduced during intervention$_2$.

Measures of the duration of social interactions were recorded during experiment I since the experimenters wished to determine what effect, if any, an increased social interaction rate would have upon duration. These data indicate that an increased social interaction rate had no appreciable effect upon the length of social interactions. There did not appear to be any systematic increase in the duration of social interactions as a function of either baseline or experimental conditions.

The duration of subject initiated interactions closely approximated the duration of peer initiated interactions (15 seconds versus 17 seconds). This balance was not appreciably affected by the intervention procedures.

It would seem that an optimal strategy for increasing social interaction rate would be to keep the length of such interactions brief. That is, interactions of long duration would tend to compete with an increased frequency. Apparently, the reinforcement contingency did not significantly alter the length of S_1's social interactions with her peers.

In summary, the intervention procedures in experiment I appeared to have a positive effect for the withdrawn subject in terms of increased social interaction rate and the number of peers interacted with. There was little effect upon duration of social interactions. The procedures also reduced the discrepancy between subject initiated and peer initiated interactions.

Experiment II

The Use of Group, Token Reinforcement to Increase Social Interaction Rate

In contrast to experiment I, the withdrawn subject's rate of initiation to her peers in experiment II was significantly below that of her peers' rate of initiation to her (.05 versus .13 per minute; $t = 5.10$, $df = 31$, $p < .001$). Thus, a reinforcement contingency was implemented for this subject which was designed to increase the rate with which she initiated to her classmates.

Procedure

The same ABAB design was used in this experiment. The withdrawn subject for experiment II was a first grade female.

Baseline$_1$. Thirty-two, 30-minute observation recordings were taken on this subject's behavior over a 2-month baseline period. Conditions in this phase were identical to those in experiment I.

Reinforcement period 1. The subject was asked to leave the room on the pretext of having to make up some work she had missed during a recent absence. At the same time, the rest of the class was taken to a projection room (in the school) where a brief discussion was held about the low rate of the subject's social interaction with peers.

The E indicated that a film would be presented to show them some ways of helping the subject increase her social interaction rate with them. The same film used in experiment I was shown and a further discussion was held to insure that the children understood the principles and techniques presented. In addition, they were informed that a reinforcer of their choice would become available when the subject had made 25 social initiations to them during scheduled observation periods. A list of possible group reinforcing events was contributed by the class and placed on the board. A vote was used to decide which event would be selected. The selected reinforcement was a trip to a new mall and a visit to a local ice cream parlor.

The classroom teacher provided a clown's face, with a paper tape protruding from the clown's mouth on which the number of points earned by the class was recorded. After each observation period, the observer informed the class about the number of points that had been earned and

the clown's "tongue" was pulled out an equivalent length. During this experimental phase, the subject was not informed that any reinforcement contingency had been established.

Baseline$_2$. During this phase, regularly scheduled observations continued to be taken. However, the class was given no information about the number of interactions occurring and no reinforcing consequences were programmed.

Reinforcement period 2. At the beginning of this phase, a second discussion was held with the class to review material contained in the film. The contingency was again explained and discussed. On this occasion, the subject remained in the room and listened to the discussion about her social behavior.

The number of points required for the reinforcing stimulus was raised from 25 to 50 points during this reinforcement period. The previous point level was considered too low since the subject was now aware of the reinforcement contingency and could respond to it without the peers' initial intervention. Suggestions were again made about possible backup reinforcers and the class chose to have an ice cream party in the classroom after reaching the required point level.

Results

Fig. 1 contains the social interaction rate of S_2 with her peers, and

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Insert Figure 1 About Here

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intermittent samples of the overall peer interaction rate across the four phases of the experiment. During experiment II, the overall rate of

social interaction averaged .39 per minute and ranged from .22 to .60 interactions per minute. This compares with a mean rate of .44 per minute and a range from .26 to .70 for $\underline{S}_1$'s peer group.

The mean rates of $\underline{S}_2$'s social interaction for each of the four phases of experiment II were as follows: baseline_1, .18; intervention_1, .93; baseline_2, .55; and intervention_2, .91. $\underline{S}_2$'s interaction rate increased dramatically during intervention_1. The rate decreased during baseline_2 and increased again when the reinforcement contingency was reintroduced in intervention_2.

Both interventions 1 and 2 increased $\underline{S}_2$'s social interaction rate to levels well above the mean of her peer group. Although her rate decreased during baseline_2, it did not return to baseline_1 levels, but maintained above the class avarage for the five observation sessions.

$\underline{S}_2$'s interaction rate was highly variable during the first 15 observation sessions of baseline_1. During the last 17 sessions of baseline_1, however, her interaction rate was much lower and much less variable. Although data are not available, the observers did note that a large proportion of the subject's interactions during the first 15 days, occurred with a single peer who sat close by. This had been arranged by the teacher who was concerned about the subject's low interaction rate. The data indicate, however, that this "intervention" had very short-term effects.

As with $\underline{S}_1$, the intervention procedure increased $\underline{S}_2$'s session-to-session variability as well as her interaction rate. For example, $\underline{S}_2$'s interaction rate varied from .00 to .75 during baseline_1 and from .39 to .58 during baseline_2. During the intervention phases, the range

increased substantially; from .49 to 1.42 during intervention$_1$ and from .29 to 1.23 during intervention$_2$.

Fig. 2 and 3 contain, respectively, the rates of interaction resulting from peer initiations and subject initiations.

Insert Figures 2 and 3 About Here

Fig. 2 indicates there was a substantial increase in the peer initiation rate to S_2 whenever the reinforcement contingency was in effect. Since experiment II was the reciprocal of experiment I, the peers were never reinforced for initiating to the subject. However, S_2's peers apparently increased their initiation rate to her in order to stimulate increased social initiations (by S_2). S_1 (in experiment I) appeared to use the same technique to increase the rate of peer initiations to her. The mean rate of peer initiations to S_2 during the four phases of experiment II were .13, .73, .39, and .62.

The data in Fig. 3 demonstrate the effects of the reinforcement contingency upon S_2's initiation rate. The baseline$_1$ data indicate that there were 14, 30-minute observation sessions in which S_2 did not initiate to any peer. The goal of experiment II was to increase her overall social interaction rate while simultaneously increasing the number of subject initiated interactions. Although there was still a considerable discrepancy between the initiation rates of S_2 and her peers in the two intervention phases, the data indicate that both goals were achieved.

The mean rate of subject initiated interactions during the four phases were: .05, .20, .16, and .29. The data indicate that the reinforcement contingency had only a minimal effect upon S_2's initiation

rate during the first four sessions of intervention$_1$. For example, S_2's initiation rate during the last 11 sessions of baseline$_1$ was .009. During the first four sessions of intervention$_1$, her rate averaged only .08 per minute. However, during the last session of intervention$_1$, her rate increased to .73 per minute.

The authors know of no correlated environmental event or contingency that would explain this sudden increase. One possible explanation could be that her peers informed her of the contingency at this point in time. Another could be that it took four sessions before the peers were effective in increasing her initiation rate to them. Her rate was higher during this session than at any other point in experiment II.

Following withdrawal of the reinforcement contingency during baseline$_2$, S_2's initiation rate decreased from .73 to .12. There appeared to be some slight recovery of the rate during observation sessions 4 and 5 within baseline$_2$. The mean rate for baseline$_2$ was .16 as compared with a rate of .20 during intervention$_1$. During intervention$_2$, her rate again increased and averaged .29 over the entire phase.

S_2's session-to-session variability also increased substantially during intervention$_2$. Her initiation rate ranged from .02 per minute to .60 per minute during this phase. There also appeared to be an accelerating trend in the initiation rate toward the end of the phase.

Fig. 4 contains the number of different peers S_2 interacted with during experiment II.

Insert Figure 4 About Here

The mean number of different peers S_2 interacted with, per session, during the four phases of experiment II were: baseline$_1$, 2.23; intervention$_1$,

3.20; baseline$_2$, 2.00; and intervention$_2$, 3.22. During the two baseline phases, the average was 2.15; during the two intervention phases, 3.21.

Thus, it appears the intervention procedures in experiment II also increased the number of different peers $\underline{S}_2$ interacted with. This replicates a similar result obtained with $\underline{S}_1$ in experiment I.

The duration of $\underline{S}_2$'s social interactions with peers averaged 16 seconds. This is identical to the average length of $\underline{S}_1$'s social interactions.

The average length of interactions initiated by $\underline{S}_2$ was 17 seconds. This compares with 15 seconds for $\underline{S}_1$. Interactions resulting from peers initiating to $\underline{S}_2$ averaged 15 seconds. In contrast, these interactions averaged 17 seconds for $\underline{S}_1$.

As in experiment I, the length of peer initiated interactions was very similar to the length of subject initiated interactions. Interaction duration also proved to be insensitive to the intervention procedures. Both these findings replicate results obtained in experiment I.

An increased length of social interactions appeared to be correlated with $\underline{S}_2$'s initially high interaction rate during the first half of baseline$_1$. There was a corresponding decrease in duration of interactions when $\underline{S}_2$'s interaction rate decreased during the second half of baseline$_2$. However, when interaction rate increased during the two intervention phases, there was no concomitant increase in duration of interactions.

Discussion

The data in Fig. 1 indicated that the treatment procedures in interventions 1 and 2 had a powerful effect in increasing $\underline{S}_2$'s social

interaction rate. As in experiment I, it was not possible to clearly isolate the effects of the symbolic modeling procedure from the reinforcement effects. However, clear reversal effects were obtained when the reinforcement contingency was withdrawn and then reintroduced. Reversal effects were obtained in both subject initiated and peer initiated interactions.

It is interesting that the peers' rate of initiating to $\underline{S}_2$ did not return to baseline$_1$ levels when the reinforcement contingency was withdrawn. This may have been due to the effects of the symbolic modeling procedure. That is, peer social interaction skills, acquired through the symbolic modeling procedure and strengthened during intervention$_1$, may have generalized to the nonreinforcement period. Further support for this hypothesis is provided by $\underline{S}_2$'s peer initiation rate during baseline$_2$. Her initiation rate of .16 was well above her rate of .05 in baseline$_1$. For whatever reason, it is encouraging to note that the initiation rate of $\underline{S}_2$ and her peers did not return to baseline$_1$ levels when reinforcement was withdrawn.

However, the number of different peers $\underline{S}_2$ interacted with per observation session did return to its baseline$_1$ level when the reinforcement contingency was removed. When the contingency was reinstated, the number per session increased. The means for interventions 1 and 2 were nearly identical (3.20 versus 3.22).

Thus, the increased interaction rate appeared to generalize from reinforcement to nonreinforcement periods to a much greater extent than did the range of peers $\underline{S}_2$ interacted with. A similar effect was also obtained for $\underline{S}_1$ during experiment I.

The data on the duration of $\underline{S}_2$'s interactions with her peers replicates results obtained with $\underline{S}_1$ in experiment I. The mean duration across all four phases were identical for $\underline{S}_1$ and $\underline{S}_2$. The close similarity between the duration of subject initiated and peer initiated interactions also replicates results obtained with $\underline{S}_1$.

The treatment procedures in experiment II were effective in increasing $\underline{S}_2$'s overall interaction rate with her peers. However, the procedures seemed to have a greater effect upon peer initiation rate than upon subject initiation rate. This is a particularly interesting finding since peers did not receive external reinforcement for initiating to $\underline{S}_2$.

The intervention procedures did increase $\underline{S}_2$'s initiation rate well above her baseline_1 rate of .05 per minute. However, the treatment effect in intervention_2 seemed to be much more effective and more consistent than it was in intervention_1. This may have been due to $\underline{S}_2$'s awareness of the reinforcement contingency in intervention_2 whereas she may not have been aware of it during intervention_1. In fact, Fig. 2 shows that, during intervention_1, her rate of interaction due to her own initiations remained at baseline_1 levels until the fifth session. The results of intervention_2 indicate that the reinforcement contingency in intervention_1 may have had a greater immediate impact upon $\underline{S}_2$'s behavior if she had been made aware of it at the beginning of the phase.

It should be pointed out that the authors cannot certify that $\underline{S}_2$ <u>wasn't</u> aware of the contingency from the beginning of intervention phase 1. Her peers could have informed her of the procedure on the first day it was implemented. However, anecdotal information provided by the observers suggested this was not the case. They reported that $\underline{S}_2$ seemed to be

somewhat overwhelmed by the sudden increase in peer initiations toward her after the contingency was implemented. This may have acted to temporarily suppress an increase in her initiation rate to peers.

In summary, the peer reinforcement contingency combined with the symbolic modeling procedure appears to be an effective technique for modifying social withdrawal. Its effectiveness in increasing subject initiated interactions may be greater if the withdrawn child is informed of the contingency in advance along with the peer group. However, another experiment would be required to verify this assumption.

Experiment III

The Use of Individual-Group Token Reinforcement to Increase Social Interaction Rate

The withdrawn subject in this experiment had an extremely low rate of social interaction with her peers. Both her initiation rate to peers and their initiation rate to her were very low and not significantly different from each other (.01 versus .02 per minute; $\underline{t} = 1.57$, $\underline{df} = 21$, and p = n.s.).

The purpose of experiment III was to investigate the combined effectiveness of the procedures used in experiments I and II. It appeared that the combined set of procedures would be most appropriate for a withdrawn child whose peer initiation rate was approximately equal to the peers' rate of initiation to her.

Procedure

An ABAB design was again used to evaluate the reinforcement contingencies. The withdrawn subject for experiment III was a second grade female.

Baseline$_1$. Twenty-three, 30-minute observation recordings were taken on this subject's behavior over a 2-month baseline period. Conditions in this phase were identical to those in experiments I and II.

Reinforcement period 1. The purpose of experiment III was simultaneously explained and discussed with the entire class, including the subject. The film was shown and a review discussion followed as in experiments I and II.

However, in this experiment, a double, interlocking reinforcement contingency was established. The subject could earn an individual, pre-selected reinforcer after her peers had made 75 social initiations to her during regularly scheduled observation periods. The class could earn its pre-selected group reinforcement after the subject had made 25 social initiations to her peers. The completion of both contingencies was required before either of the reinforcers could be dispensed.

Two "thermometer" charts were placed on the wall of the classroom, one for each of the contingencies. After each observation period, the observer announced the number of points earned by the subject and by the class. The point totals were subsequently recorded on the wall charts.

The subject chose a Johnny Cash record as her selection. The class, after much discussion and a series of votes, decided upon a trip to the downtown mall with a stop at a popular ice cream parlor.

Baseline$_2$. During this phase, regularly scheduled observations were continued. However, no points were awarded and no reinforcement contingencies were programmed.

Reinforcement period 2. During this phase, the subject matter of the film and the purpose of the program were again discussed with the

subject and her peers. The same reinforcement contingencies were also reestablished. During this reinforcement period, the subject chose a pet white rat and a cage as a backup reinforcer. The class decided upon a picnic in a nearby park. Wall charts were set up to record the awarding of points, as before.

Results

Fig. 1 contains the social interaction rate of $\underline{S}_3$ with her peers during the four phases of experiment III.

Insert Figure 1 About Here

The overall peer interaction rate is also plotted in Fig. 1; this averaged .28 throughout experiment III and ranged from .16 per minute to .37 per minute.

Subject 3 had an extremely low rate of interaction with her peers during the baseline$_1$ phase of experiment III. No social interactions occurred between $\underline{S}_3$ and any of her peers during 12 of the 23 sessions in which she was observed. Her total interaction rate during baseline$_1$ averaged .03 per minute.

There was a substantial increase in her total interaction rate during intervention$_1$ followed by a sharp decrease during baseline$_2$. There was another parallel increase in rate during intervention$_2$. $\underline{S}_3$'s interaction rate during intervention$_1$, baseline$_2$, and intervention$_2$ was, respectively, .76, .25, and 1.05.

As in experiments I and II, $\underline{S}_3$'s interaction rate, during interventions 1 and 2, was increased to levels considerably above the mean

interaction rate of her peers. During baseline$_2$, her mean rate (.25) was slightly below the average peer interaction rate (.28). This replicates the result obtained in experiment I with $\underline{S}_1$. In contrast, $\underline{S}_2$'s interaction rate in experiment II maintained well above her peers' interaction rate during baseline$_2$.

In both interventions 1 and 2, there was a sharp increase in $\underline{S}_3$'s total interaction rate shortly after the intervention procedures were implemented. For example, during the second observation session of intervention$_1$ and during the first session of intervention$_2$, $\underline{S}_3$'s rate was 1.48 and 1.99, respectively. However, in both interventions, the rate leveled off to a mean figure of approximately .90 interactions per minute. The rate remained fairly stable from this point until the end of each intervention.

The increase in session-to-session variability, during intervention phases, was most clearly demonstrated for $\underline{S}_3$. For example, her interaction rate varied from .00 to .25 during baseline$_1$ and from .02 to .47 during baseline$_2$. During intervention$_1$, her rate varied from .11 to 1.48; during intervention$_2$, from .69 to 1.99.

Insert Figures 2 and 3 About Here

Fig. 2 contains the rate of peer initiated interactions and Fig. 3 the rate of subject initiated interactions. The mean rate of peer initiated interactions during the four phases of experiment III were: baseline$_1$, .02; intervention$_1$, .60; baseline$_2$, .15; and intervention$_2$, .89. The corresponding rates for subject initiated interactions were: baseline$_1$, .01; intervention$_1$, .16; baseline$_2$, .10; and intervention$_2$, .16.

By examining Fig. 2 and 3, it is clear that the major portion of $\underline{S}_3$'s increased interaction rate during interventions 1 and 2 was accounted for by peer initiated interactions. Thus, the initial increase in rate that was followed by a relatively stable leveling off period can be attributed largely to peer initiated interactions.

$\underline{S}_3$'s initiations to peers increased from a rate of .01 per minute to a rate of .16 per minute during intervention$_1$. The rate decreased to .10 during baseline$_2$ and again increased to .16 during intervention$_2$. There was a much greater proportional increase in rate for peer initiated interactions than there was for subject initiated interactions.

$\underline{S}_3$'s rate of subject initiated interactions increased in session-to-session variability as well as in overall rate. There appeared to be no systematic trend in the data during intervention$_1$. However, her rate during intervention$_2$ was much less variable and showed an accelerating trend.

Fig. 4 contains the number of different peers $\underline{S}_3$ interacted with during each observation session.

Insert Figure 4 About Here

The mean number of different peers $\underline{S}_3$ interacted with per session was substantially increased during each of the phases was as follows: 1.14, 6.60, 4.40, and 6.20.

The number of different peers $\underline{S}_3$ interacted with per session was substantially increased during interventions 1 and 2. Although there was a decelerating trend during baseline$_2$, the baseline$_1$ frequency was not recovered during this phase. This is in contrast to $\underline{S}_1$ and $\underline{S}_2$ whose frequencies did return to baseline$_1$ levels (or below) during baseline$_2$.

$\underline{S}_3$'s social interactions were of a much shorter, average duration than those for $\underline{S}_1$ and $\underline{S}_2$. Her interactions averaged only 11 seconds

over the four phases of experiment III. Subject initiated interactions averaged 10 seconds and peer initiated interactions averaged 12 seconds. Thus, the balance between the length of subject initiated and peer initiated interactions was replicated for $\underline{S}_3$.

Discussion

As in experiments I and II, clear reversal effects were obtained whenever the reinforcement contingency was withdrawn and then reintroduced. However, neither subject initiated nor peer initiated interaction rates returned to their baseline_1 levels when the contingency was withdrawn during baseline_2. This result may or may not have been due to the effects of the symbolic modeling procedure.

The primary effect of the reinforcement contingency in experiment III was to increase $\underline{S}_3$'s rate of social interaction with her peers. The contingency produced a much higher rate of peer initiated interactions than subject initiated interactions which may have been due to the way in which the contingency was established. That is, the peer group had to initiate 75 interactions with $\underline{S}_3$ while she had to initiate only 25 interactions with her peers in order to meet the requirements of the contingency. This automatically built in a higher peer initiation rate than subject initiation rate.

The contingency requirements were divided 75-25 instead of 50-50 since the experimenters felt it was unrealistic to require $\underline{S}_3$ to initiate 50 interactions before she could exchange her points for the backup reinforcer. Her extremely low rate of initiation to peers in baseline_1 made such a requirement unfeasible. However, if the

reinforcement requirements of the contingency had been set up equally, it may have reduced the discrepancy between the rate of subject initiated and peer initiated interactions during interventions 1 and 2.

The differences in the rates of interaction initiated by the subject compared with her peers had a further effect which is reflected in the decelerating trend in the total social interaction rate which occurred halfway through each intervention period. The peers quickly ran off the number of initiations required for the subject's reinforcement, and subsequently reduced their rates of initiations as they waited for the subject to reach the criterion necessary for both reinforcers to be dispensed. It is interesting to note, however, that the peers did not stop initiating, even though further responses from them would not result in any more points. Presumably, their initiating behavior was maintained in order to stimulate the subject to further initiations to them.

The reinforcement contingency also greatly increased the range of peers that $\underline{S}_3$ interacted with during intervention periods. This frequency averaged 6.40 per session during the two intervention phases and 4.40 during baseline$_2$, compared with a frequency of 1.14 during baseline$_1$. The increased number of peers $\underline{S}_3$ interacted with generalized to non-reinforcement periods (baseline$_2$) to a much greater extent than for $\underline{S}_1$ and $\underline{S}_2$.

The generalization to nonreinforcement periods may have been due to the interlocking nature of the reinforcement contingency in experiment III. In experiments I and II, the reinforcement contingency was specific to either the subject or the peer group which could have accounted for the substantially lower frequency of peers that $\underline{S}_1$ and $\underline{S}_2$

interacted with during interventions 1 and 2. $\underline{S}_3$, on the other hand, interacted with a much larger number of peers during the interventions periods. As a result, the increased frequency may have been much slower to extinguish for $\underline{S}_3$.

The authors were unable to determine empirically, whether $\underline{S}_3$'s initially low interaction rate was related to the relatively brief duration of her interactions with peers. Interactions initiated by $\underline{S}_3$ as well as interactions initiated by peers were of a much shorter duration than those of $\underline{S}_1$ and $\underline{S}_2$.

The mean duration of peer initiated interactions showed an increase during intervention$_1$ (from 6 to 8 seconds). However, the duration continued to increase during baseline$_2$ (15 seconds) and intervention$_2$ (17 seconds). This result suggests that the increase was related to the reinforcement contingency in only a very general way, if at all.

The mean duration of subject initiated interactions showed an increase during intervention$_2$ (from 6 to 17 seconds). However, there was no increase in the duration of interactions in intervention$_1$ (over baseline$_1$). This increase is equally difficult to relate to the reinforcement contingency alone.

It would have been interesting to determine if the increased duration of both subject and peer initiated interactions, during intervention$_2$, would have maintained indefinitely following withdrawal of the reinforcement contingency. If this were the case, it would suggest that the increased duration was being maintained by variables whose operation may have been stimulated but not controlled by the reinforcement contingency.

For example, it is likely that the range of S_3's social skills was more limited than the other two subjects; during $baeline_1$, her rate of interaction was extremely low demonstrating that she rarely practiced such behaviors. Presumably, the deficiency in those skills necessary to maintain social interaction resulted in shorter durations of interactions for S_3. The film and the initial reinforcement period may have had the effect of providing cues about social interaction and motivating her to practice such behaviors; in fact, the peers' increase in initiations forced her to do so. One can only speculate that the increased practice and presumed increase in her reinforcing power finally resulted in increased durations during $intervention_2$.

In summary, the intervention procedures in experiment III produced dramatic increases in S_3's overall interaction rate. The reinforcement contingency in experiment III appears most appropriate for changing the isolate behavior of extremely withdrawn children.

General Discussion

The results of experiments I, II, and III indicate that all three interventions were effective in increasing social interaction rate. Although the combined procedures in experiment III produced the most dramatic changes in interaction rate, the interventions in experiments I and II also achieved the therapeutic goals for which they were designed.

However, some unexpected effects resulted from application of the reinforcement contingencies in experiments I and II. For example, in experiment I, S_1's rate of initiating to peers was increased as was her peers' rate of initiating to her, even though S_1 was never reinforced

for initiating to peers. Similarly, in experiment II, S_2's peers greatly increased their rate of initiating to her even though they were never reinforced for doing so. The contingencies also increased the number of different peers the withdrawn subjects interacted with. Thus, the effect of the intervention procedures was to change the behaviors to which they were directly applied and to also produce concurrent changes in social behaviors to which they were never applied. These reinforcement contingencies would appear to have more therapeutic impact, and possibly more enduring effects, than those that only produce changes in the behavior classes to which they are directly applied. An example of the latter may be reinforcement dispensed for simply initiating to others.

The reinforcement contingencies in this study were programmed so that neither the withdrawn child or her peers could receive reinforcement for simply initiating to each other. In order to meet the requirements of the contingencies, either the withdrawn child and/or her peers had to alter their interactive behavior so as to facilitate an increased initiation rate of the other. The specific processes that the withdrawn subjects and their peers used to achieve this goal are of major interest. Unfortunately, it was not possible in this study to precisely determine what these processes were.

It could have been that the withdrawn subjects and their peers systematically applied skills acquired through the symbolic modeling procedure to selectively reinforce and strengthen each other's initiation rates. However, the authors have no evidence to demonstrate that this was actually the case. It is possible that the same effects could have been achieved with the reinforcement contingencies alone, without the symbolic modeling procedure.

An alternative hypothesis holds that the withdrawn subjects and their peers did not employ specific, therapeutic techniques, but simply became more "attentive" and socially responsive to each other. It may be that such consequences were delivered contingent upon social initiations during intervention phases and noncontingently during baseline phases. Again, it was not possible to confirm or disconfirm this hypothesis in the present study.

A third hypothesis holds that $\underline{S}_1$'s increased rate of initiating to her peers accounted for the reinforcement effect(s) in experiment I. Conversely, the increased rate of initiating to $\underline{S}_2$ by her peers accounted for the reinforcement effect(s) in experiment II. The data in experiment I indicate that there was a high correlation between $\underline{S}_1$'s initiation rate and the increase in her peers' initiation rate. Similarly, in experiment II, $\underline{S}_2$'s increased initiation rate was highly correlated with an increased rate of peers initiation to her. In spite of these covariant relationships, it was not possible to establish that one rate increase either caused or was caused by an increase in the other.

When peers respond to a reinforcement contingency or a symbolic modeling procedure by increasing their interaction rates with each other, it would appear important to determine which behavior changes (of the peers involved) are functionally related to the rate increases. The identification of such parameters could conceivably provide information on how social withdrawal develops and is maintained in young children.

This question is also related to the maintenance of increased social interaction rates following termination of formal treatment procedures. If the behavior changes that control increased social interaction rates

are maintained, either artifically or naturally, then the interaction rates themselves should maintain. Until these variables are identified, alternative procedures will have to be used to achieve generalization of increased social interaction rates both across time and across settings.

In each of the three experiments, the rate of interaction during the second baseline period remained considerably above the $baseline_1$ level. The apparent increase in generalization across time may have been due simply to the observers' presence. During the $intervention_1$ period, the presence of an observer also signaled the availability of tokens for social initiation. During $baseline_2$, even though reinforcers were no longer dispensed, the observers may have become conditioned stimuli for social interaction as a result of their earlier pairing with powerful reinforcers. In experiments I and III, however, the data indicate that whatever was accounting for increased social interaction rates at the beginning of the second baseline period quickly began to lose its effectiveness. If the generalization effect was due to the stimulus control of the observers, then it appears that more pairings would be required for longer periods of maintenance.

It may be that if the treatment procedures are left in effect long enough, social interactions will become intrinsically reinforcing, and the increased rate will maintain automatically. Unfortunately, it is not known how long the treatment procedures have to be in effect for this result to occur.

An increased social interaction rate, if maintained long enough, could possibly stimulate the operation of other variables that would

maintain the rate. For example, a study by Baer and Wolf (1970) indicates that the preschool social environment can function as a natural community of reinforcement for maintaining behaviors that have high enough rates to enter this system. In the above study, the authors used a combined priming and social reinforcement technique to increase a withdrawn child's interaction rate with his peers. The treatment procedure was then systematically withdrawn and reintroduced over time until withdrawal no longer produced a reversal effect. That is, the interaction rate maintained at the same level but unsupported by the treatment procedures. Presumably, the rate was being maintained by reinforcers available within the preschool environment. However, the systematic withdrawal and reintroduction of the treatment program, which was in itself a fading-scheduling procedure, could also have contributed to the maintenance of the increased rate.

Additional research is needed to program indefinite maintenance of increased social interaction rates following termination of formal treatment procedures. The identification and use of natural communities of reinforcement is one potential method for accomplishing this task. Another important technique is the scheduling of reinforcements, whether contrived or natural, during treatment so as to delay the process of extinction. Methods of gradually fading out the treatment procedure may be yet another method for achieving this goal.

Numerous studies have demonstrated that a technology is available for increasing social interaction rate. However, the question of whether these effects generalize across settings, over the long term, and to other persons (not involved in treatment) has not been clearly answered.

If such is not the case, a similar technology needs to be developed for achieving generalization.

The present study also evaluated the feasibility of using token reinforcement procedures to modify isolate behavior. Tokens (points) were very effective in increasing social interaction rate for all three subjects. However, the extent to which increased social interaction rate maintains following withdrawal of tokens is a largely unanswered question. It is possible that social interaction rates would maintain better following the use of natural social reinforcers (praise, adult or peer attention) than they would following the use of contrived reinforcers during treatment. However, this also appears to be an empirical question that has not been clearly answered.

If, as Baer and Wolf (1970) suggest, an extremely low rate of behavior prevents entry into a natural community of reinforcement, then it appears the specific techniques used would be relatively unimportant as long as a reliable increase in rate is achieved. Once this has occurred, the natural reinforcement system in the environment would support the behavior and thereby maintain it. However, it is not known to what level the rate must be increased nor how long it must be maintained at that level before the natural reinforcement system "locks in" and supports the behavior indefinitely.

In conclusion, the symbolic modeling procedure combined with the three reinforcement contingencies appeared to have a substantial impact and considerable generality in modifying social withdrawal. The combined individual-group reinforcement contingency is powerful and seems to be most appropriate for changing the behavior of withdrawn children who have extremely low rates of social interaction. The individual

reinforcement contingency in experiment I seems most appropriate for increasing the rate of peer initiations to the withdrawn child. Conversely, the group reinforcement contingency in experiment II seems appropriate for increasing the withdrawn child's initiation rate to peers. However, the effectiveness of this contingency appears to be increased if the child, as well as the peer group, is informed of the nature of the contingency in advance.

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Footnotes

1 The authors wished to express appreciation to Edward Fiegenbaum, Margaret Glim, Cliff McKeen, and Linda Levy for their efforts in data collection, reviewing the manuscript, and in implementing the study.

2 A copy of the manual describing the observation and scoring procedures for recording individual social interactions as well as normative data can be obtained from the authors.

Figure Captions

Experiment I

Fig. 1 Total Interaction Rate Per Observation Session

Fig. 2 Interactions Resulting from Peers Initiating to Subject

Fig. 3 Interactions Resulting from Subject Initiating to Peers

Fig. 4 Number of Different Peers Interacted with During Each Observation Session

Experiment II

Fig. 1 Total Interaction Rate Per Observation Session

Fig. 2 Interactions Resulting from Peers Initiating to Subject

Fig. 3 Interactions Resulting from Subject Initiating to Peers

Fig. 4 Number of Different Peers Interacted with During Each Observation Session

Experiment III

Fig. 1 Total Interaction Rate Per Observation Session

Fig. 2 Interactions Resulting from Peers Initiating to Subject

Fig. 3 Interactions Resulting from Subject Initiating to Peers

Fig. 4 Number of Different Peers Interacted with During Each Observation Session

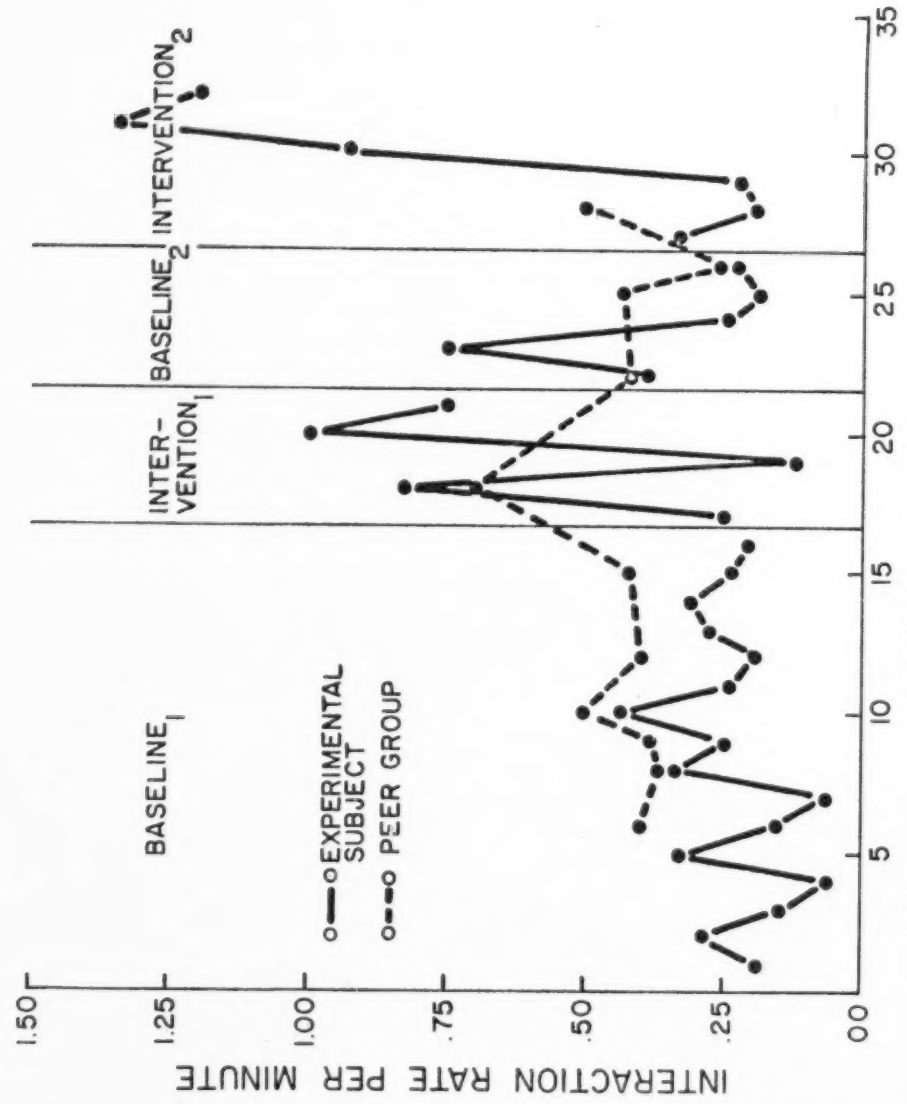


FIGURE 1. TOTAL INTERACTION RATE PER OBSERVATION SESSION

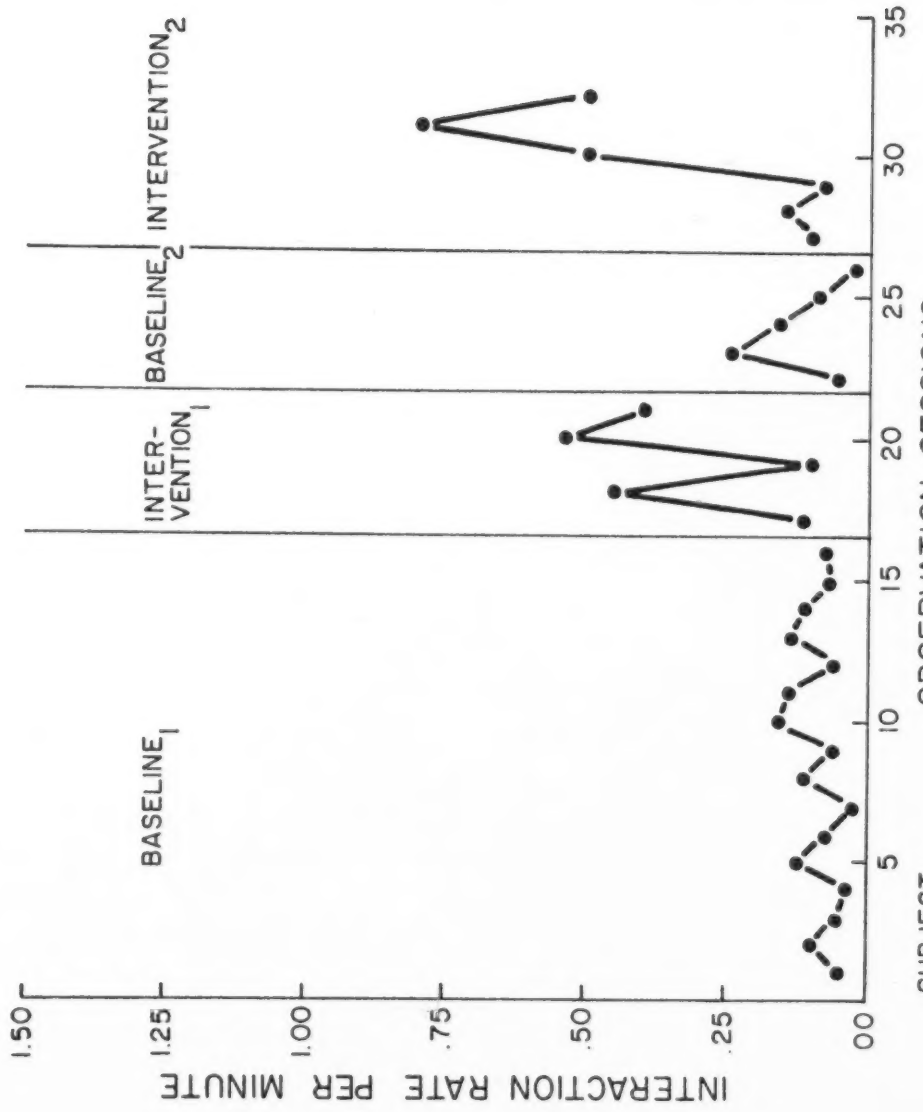


FIGURE 2. INTERACTIONS RESULTING FROM PEERS INITIATING TO SUBJECT

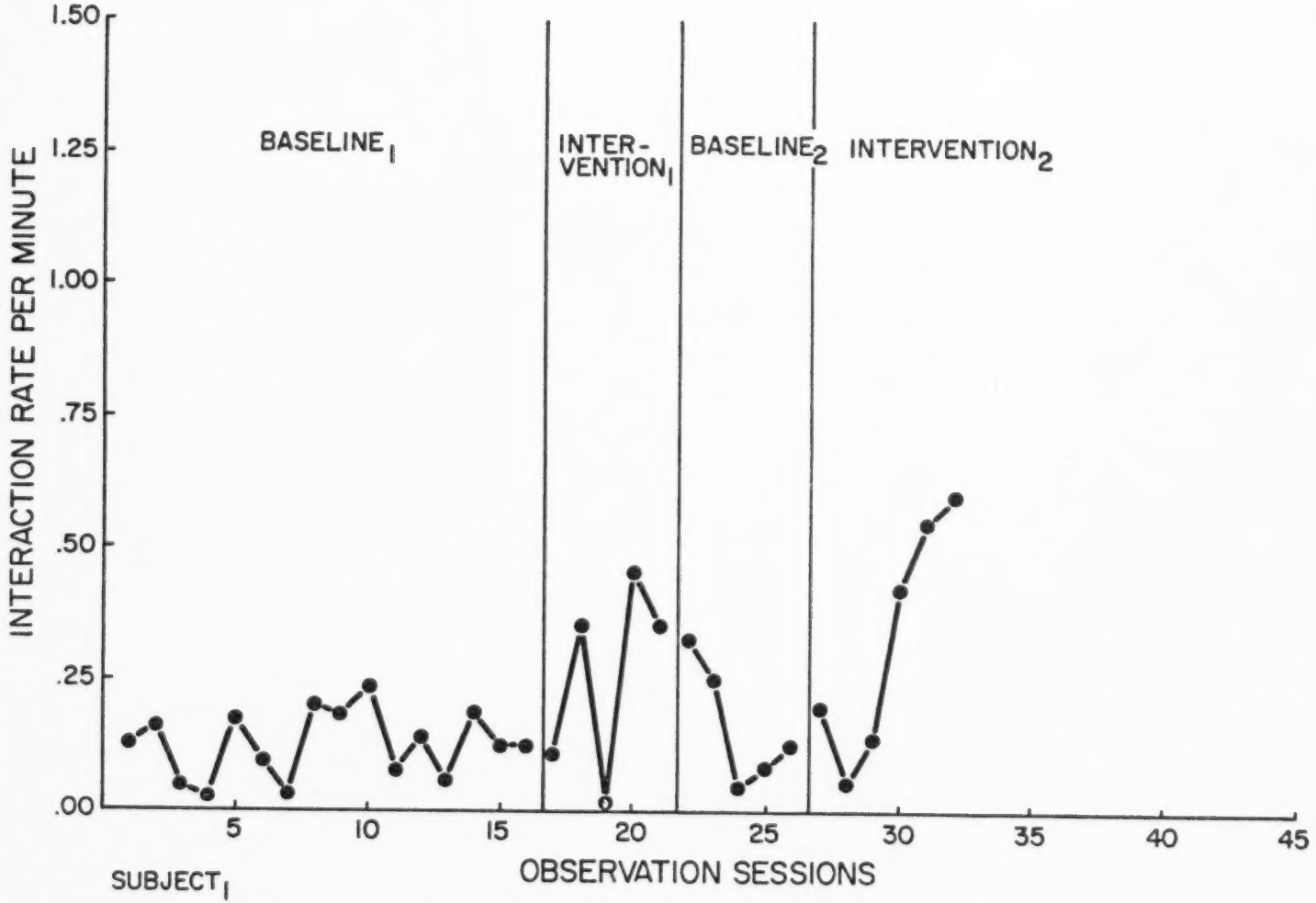


FIGURE 3. INTERACTION RESULTING FROM SUBJECT INITIATING TO PEERS

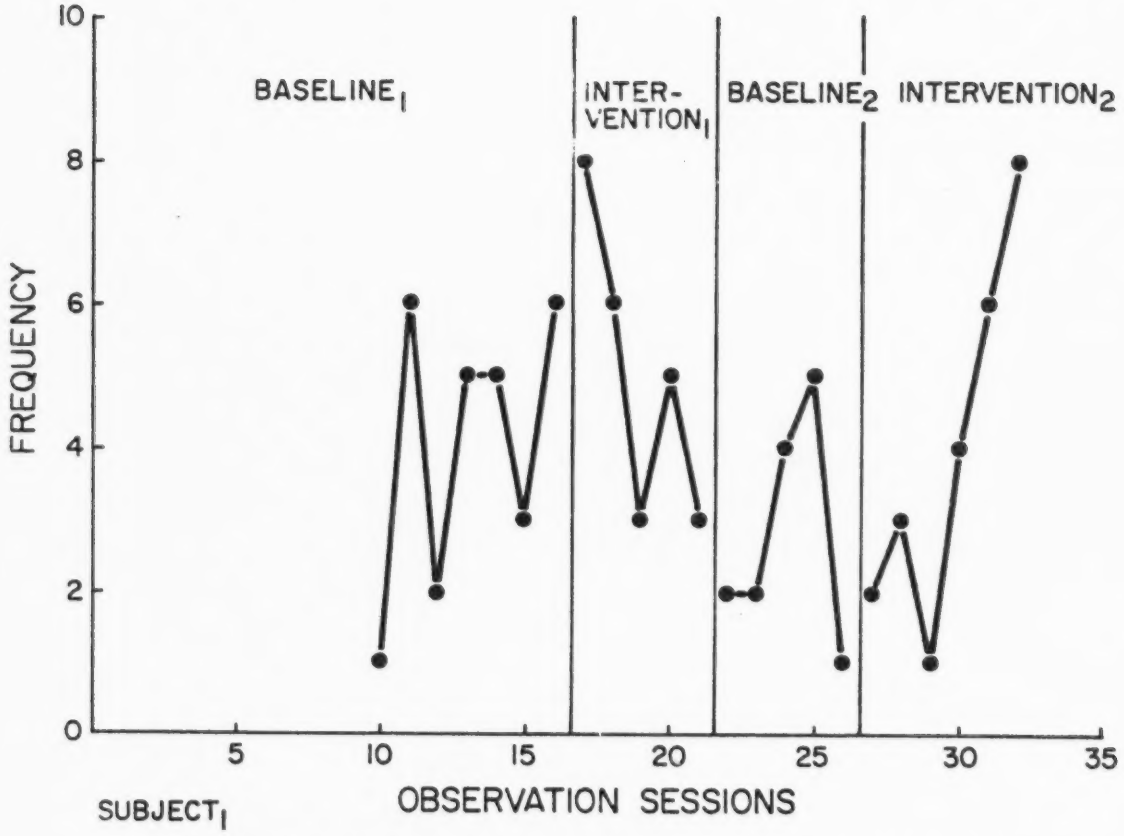


FIGURE 4. NUMBER OF DIFFERENT PEERS INTERACTED WITH DURING EACH OBSERVATION SESSION

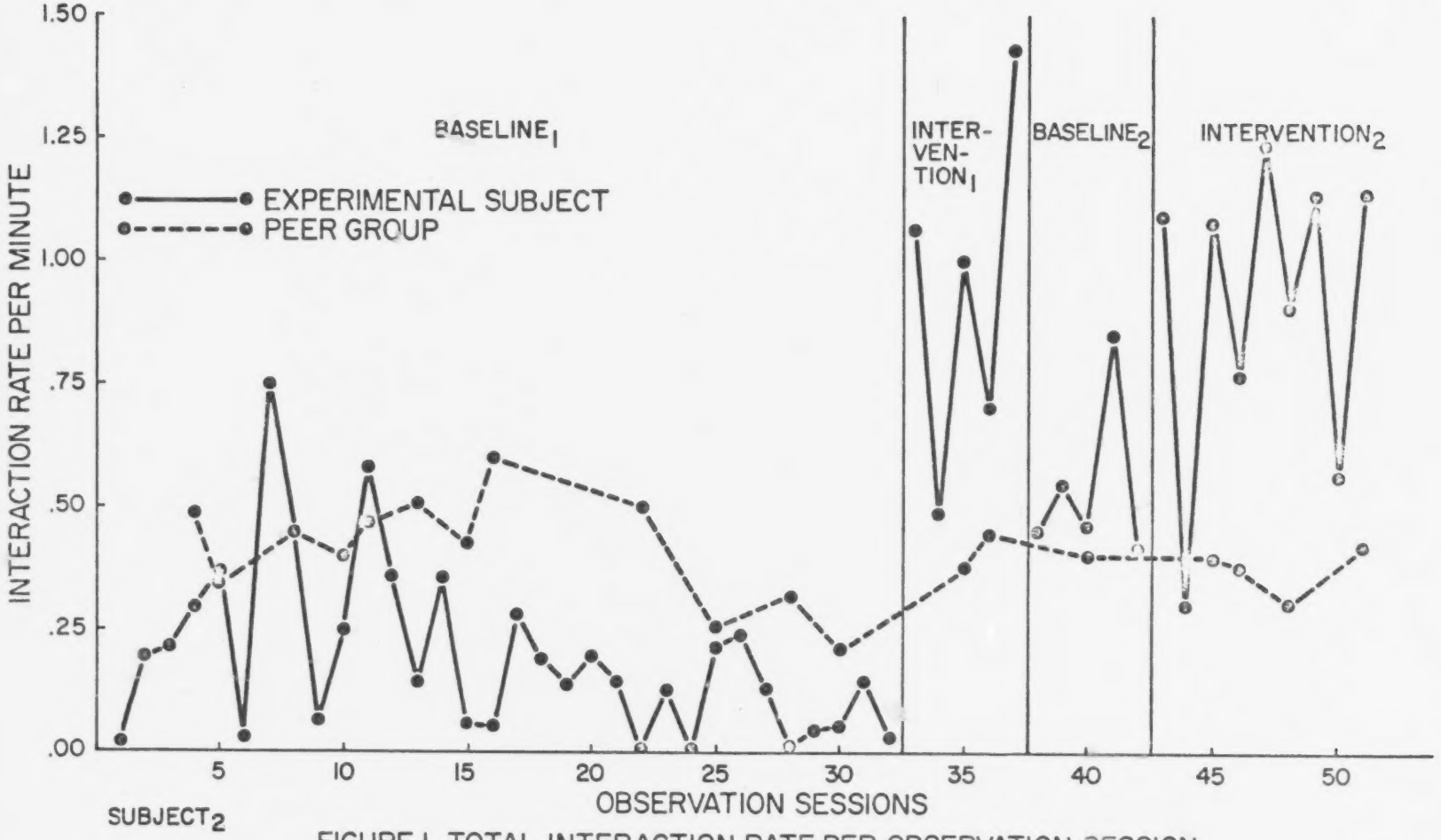


FIGURE I. TOTAL INTERACTION RATE PER OBSERVATION SESSION

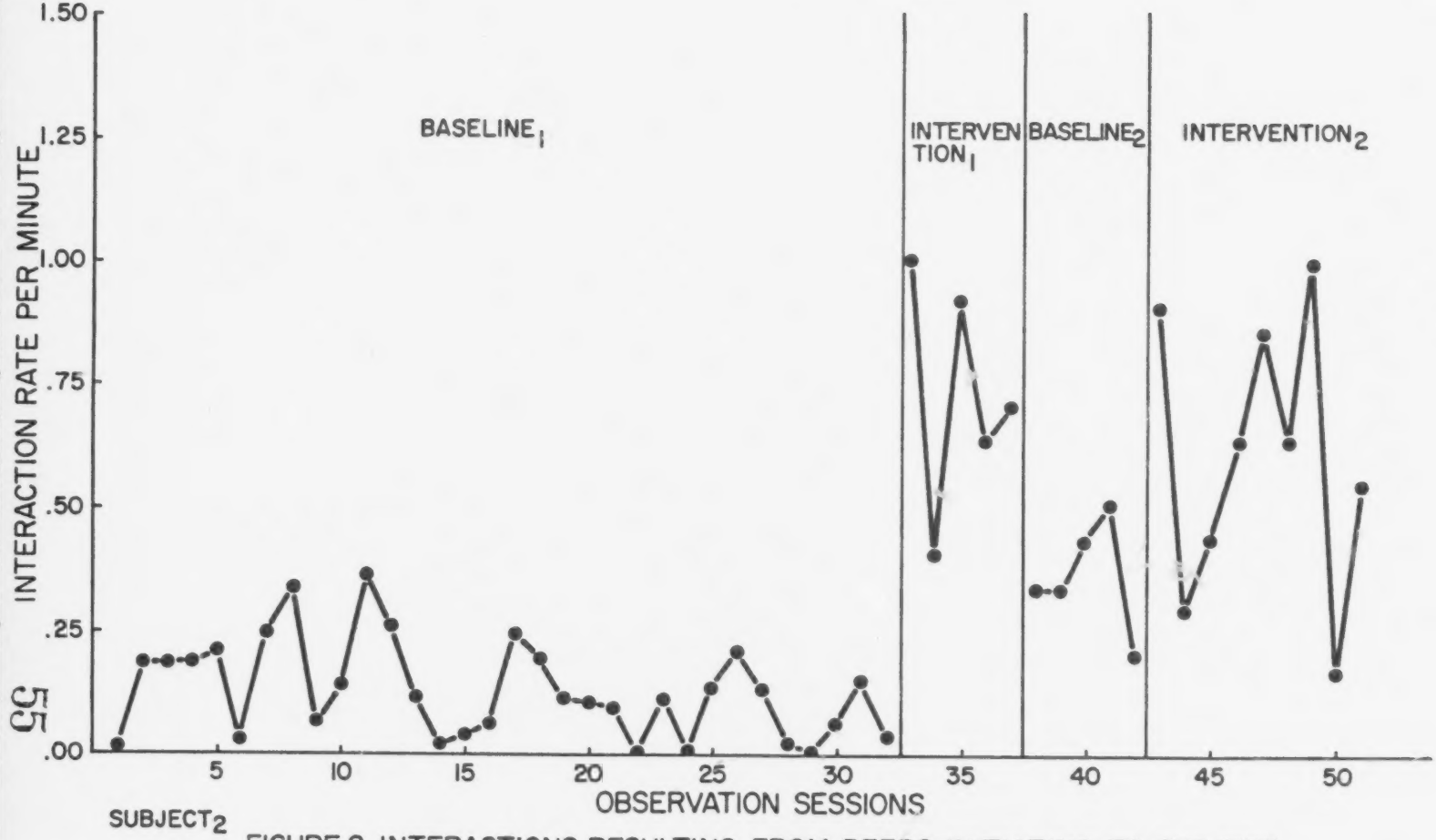


FIGURE 2. INTERACTIONS RESULTING FROM PEERS INITIATING TO SUBJECT

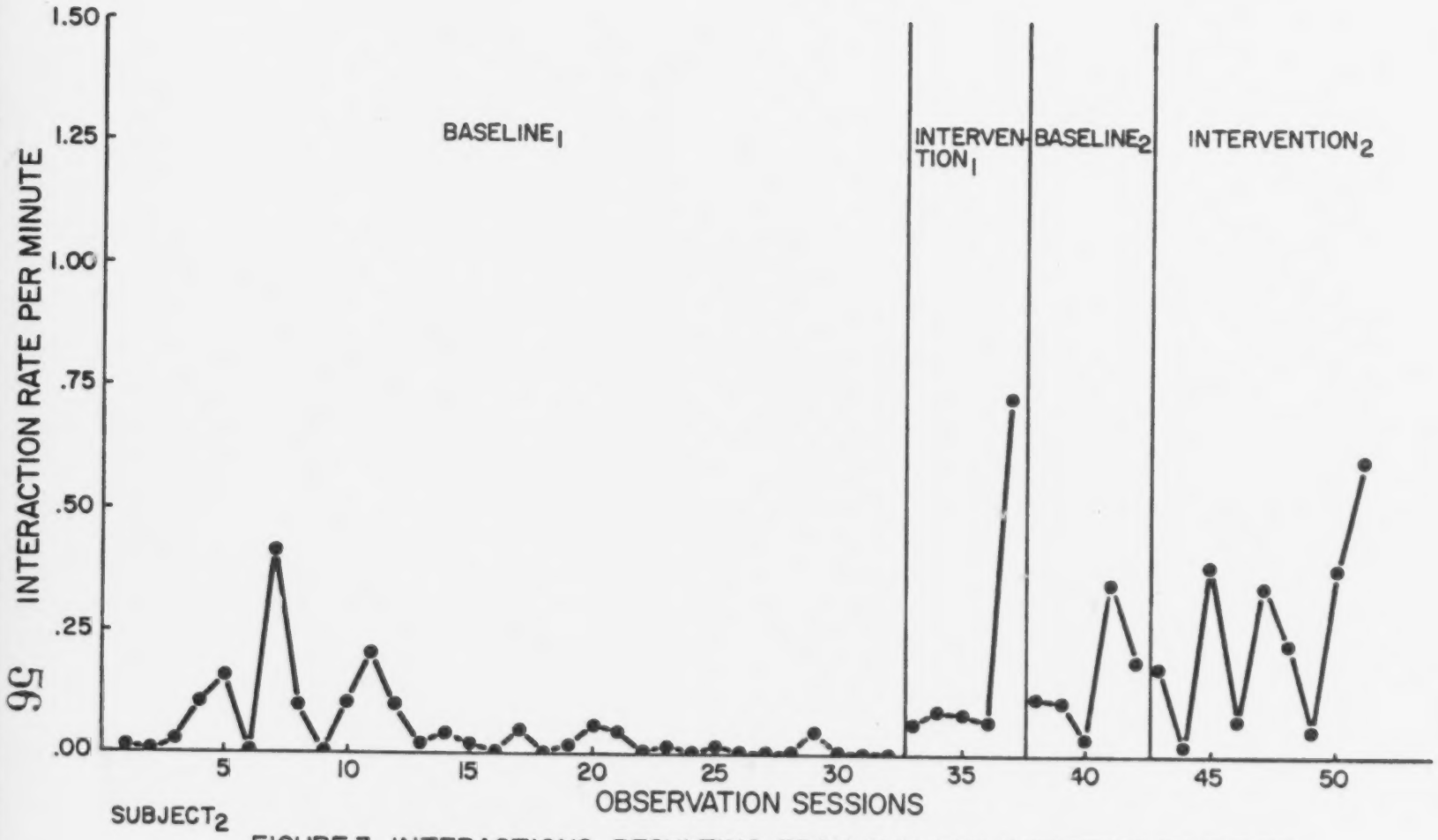


FIGURE 3. INTERACTIONS RESULTING FROM SUBJECT INITIATING TO PEERS

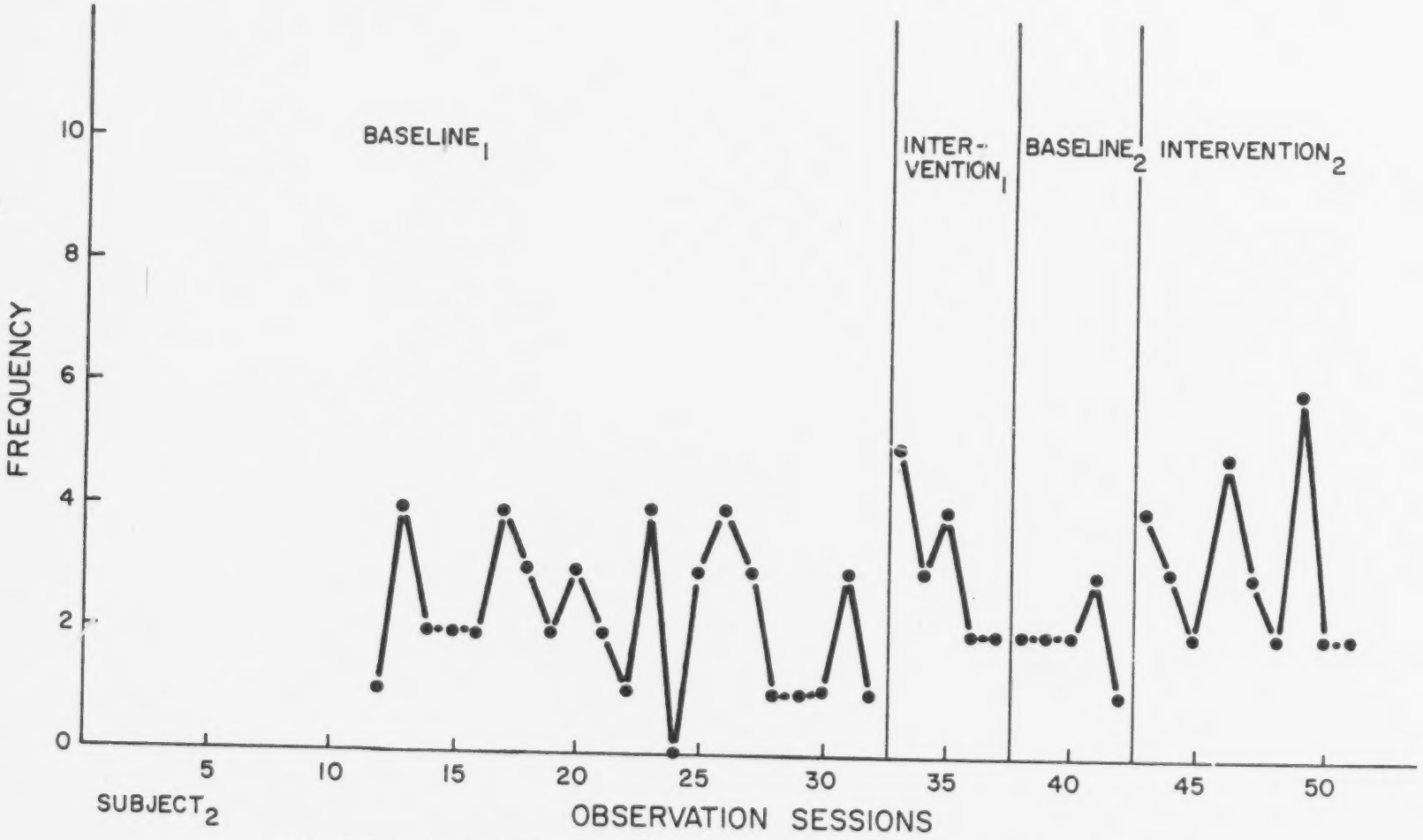


FIGURE 4. NUMBER OF DIFFERENT PEERS INTERACTED WITH DURING EACH OBSERVATION SESSION

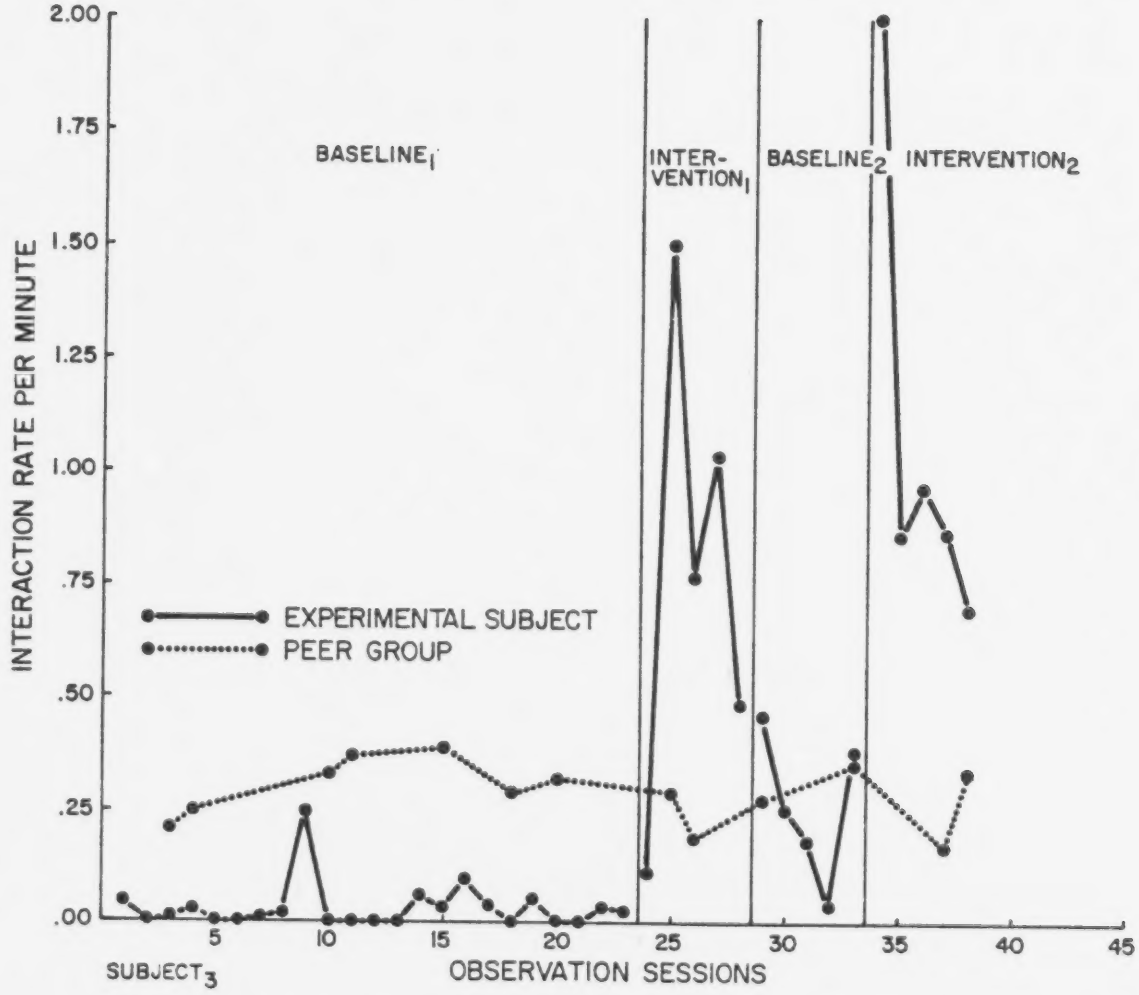


FIGURE 1. TOTAL INTERACTION RATE PER OBSERVATION SESSION

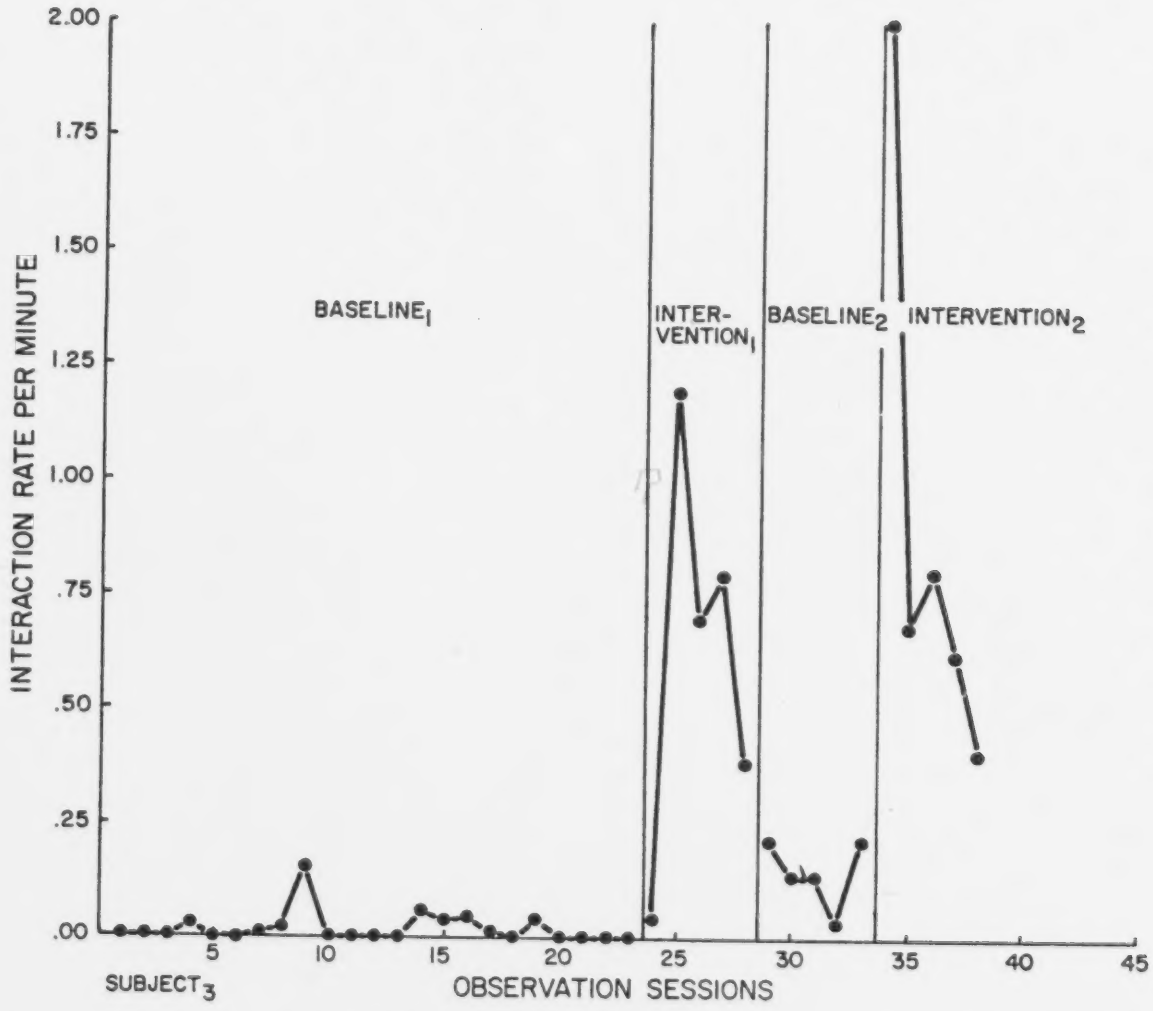
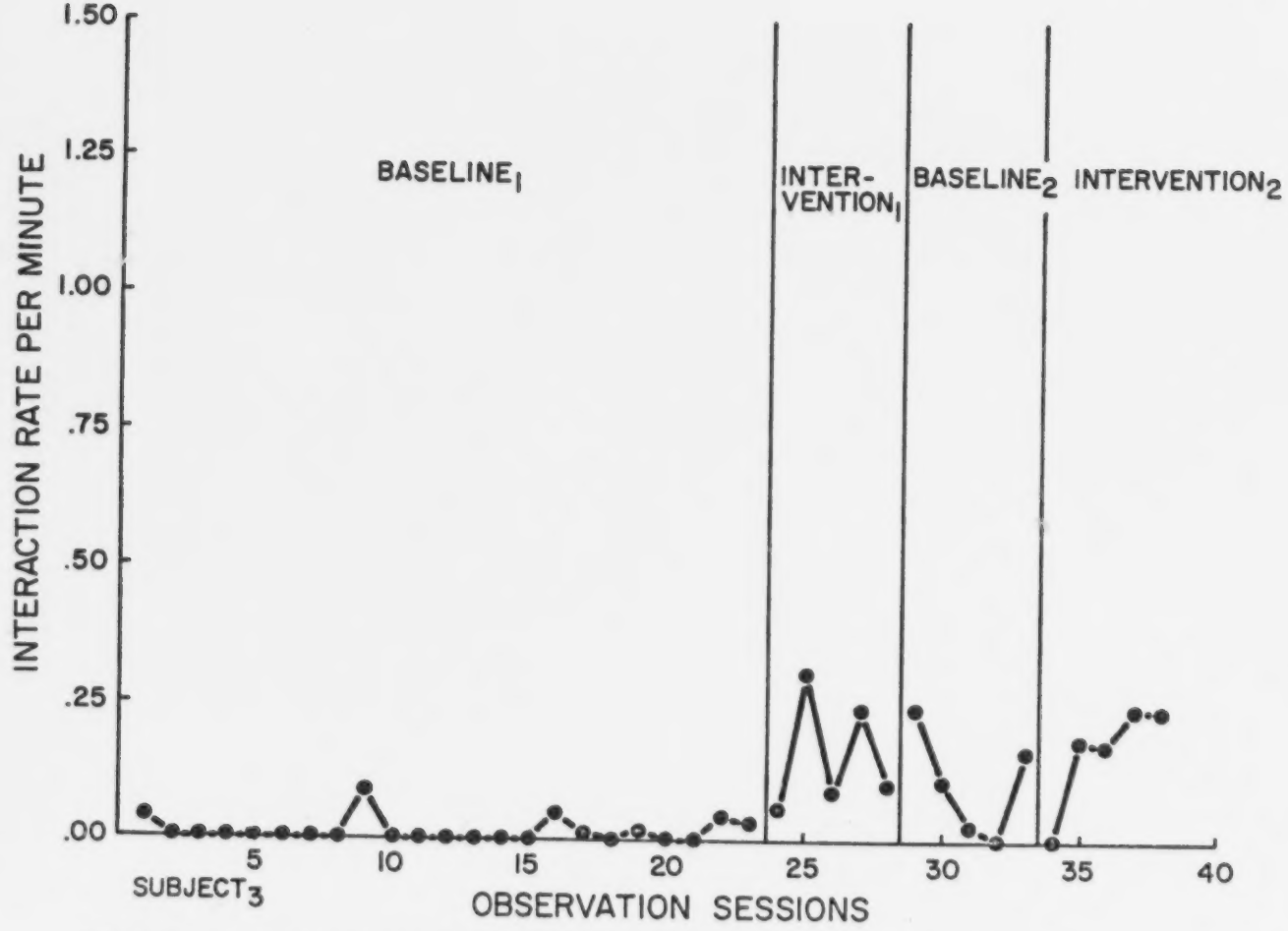


FIGURE 2. INTERACTIONS RESULTING FROM PEERS INITIATING TO SUBJECT



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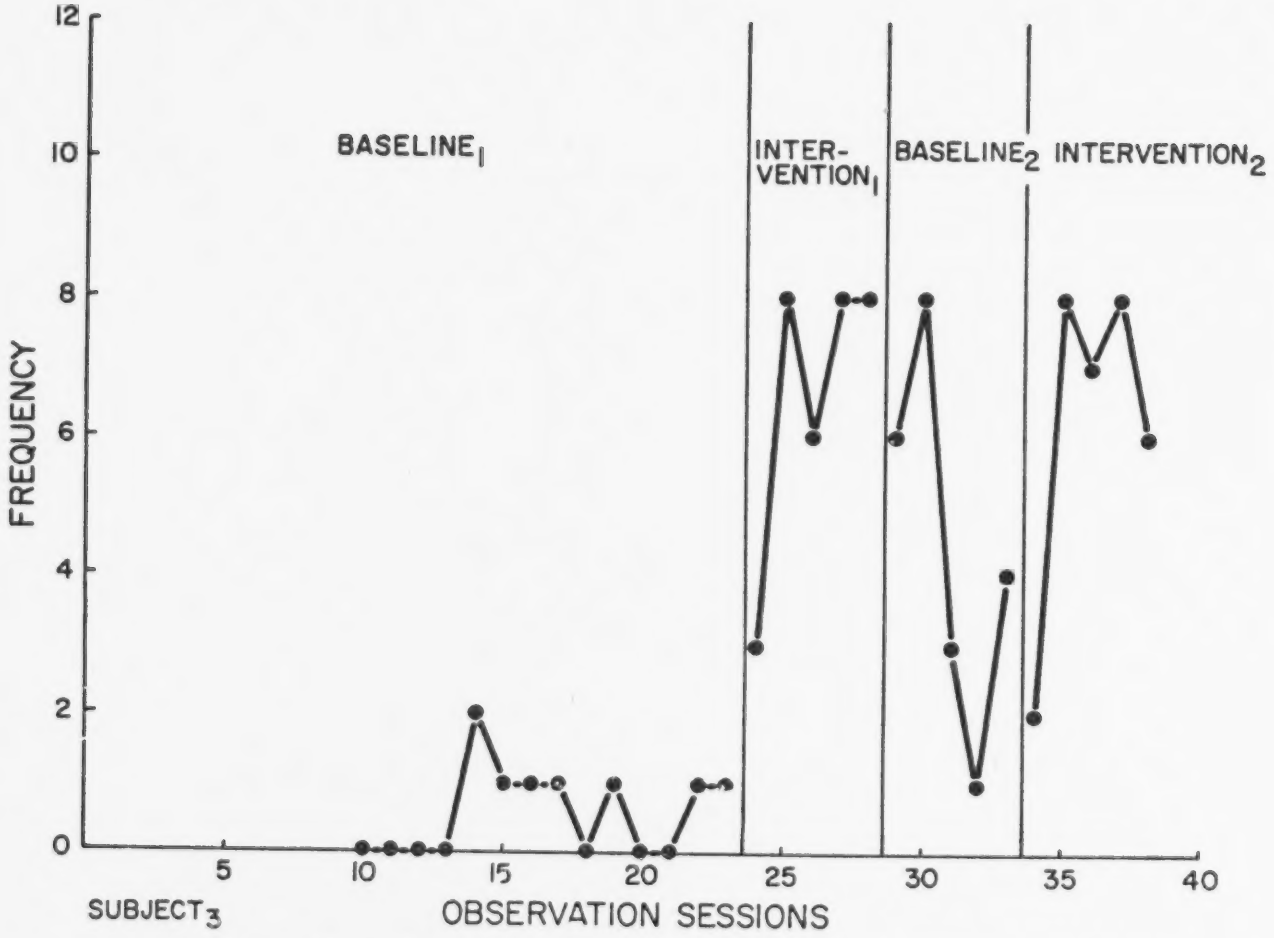

FIGURE 4. NUMBER OF DIFFERENT PEERS INTERACTED WITH DURING EACH OBSERVATION SESSION